

This section discusses the sample design approach implemented to collect the on site data. It also discusses the data collection process.

### **3.1 SAMPLE DESIGN**

Data collection to characterize building practices under the new code consisted of site inspections at newly built single- and two-family homes. A random sample of homes was selected to provide a basis for statistically valid estimation of statewide code compliance and baseline construction practices.

The general strategy for the sample design was a simple random sample of all new homes in the state, due to concerns about finding enough willing homeowners to obtain the 200 telephone surveys and 160 site visits. The sample was designed to provide a total of 160 visits, and 158 site visits were completed.

#### ***3.1.1 Details of the Sample Implementation***

The sample frame was developed by comparing the 2000 and 2001 grand lists for each town in the state. For most of the 252 towns in Vermont, the grand lists were obtained from the Vermont Department of Property Valuation. Fourteen towns were excluded from the sample because the grand lists were not readily accessible and the level of new construction was low. For twenty-seven towns, the list of new homes was obtained directly from the town clerk.

A nested sampling approach was employed. First, potential participants were asked to respond to the telephone survey, and then solicited for the on site survey after completion of the phone questionnaire. The 200 phone surveys were completed before a sufficient number of on site participants were identified. Seventy-six of the 158 participants were identified in this manner. For these 76 respondents, it was possible to compare phone survey responses to on site data.

To reach the survey quota, additional participants were solicited from the remainder of the sample frame. A total of 232 homeowners agreed to the on site during the initial solicitation, resulting in the completion of 158 site visits.

### **3.2 DATA COLLECTION**

We conducted site visits to the selected homes between February and August 2002. The field work was conducted by seven subcontractors, covering different sections of the state. Visits were performed by prior appointment only. Most visits occurred during normal working hours,

but some were also performed during evenings and on Saturdays to achieve a sufficient participation sample size for the study's requirements and to avoid possible bias related to restricting the study to homeowners who are available during regular business hours.

Building components were checked through visual inspection and measurement. Several procedures were used to collect the data for each home: attics were accessed (if possible) and thoroughly inspected; walls were visually inspected; windows were checked for the presence of low emissivity (low-e) coatings; equipment nameplate data were recorded; blower doors were operated to identify building air exchange rates (Minneapolis Blower Door); and ducts were visually inspected. Homeowners were questioned about house components that could not be ascertained through visual inspection, as well as heating fuel usage, and use of ventilation systems and other general house information. If available, the auditors also used plans and the RBES certificate to ascertain the required information. In addition to data collection to assess code compliance, lighting and appliance data were gathered.

A premium was paid to each homeowner as a way of thanking them for their time and participation. A written report will be prepared and mailed to homeowners showing how their home compared to the average survey results.

A data collection form was used to enter the onsite data (see Appendix 1). On average, about 560 data points per home were collected. All the survey data collected onsite then were entered into a database and prepared for analysis. Table 3-1 summarizes the categories of data collected.

The detailed data collected for the envelope segments and heating system was used to assess code compliance based on the U-value/area methodology that is utilized by the VTCheck software.

**Table 3-1**  
**Summary of Data Collected for Each House**

Data Category	Types of Data Collected
General Information	<ul style="list-style-type: none"> <li>• Owner name, address</li> <li>• Completion/occupancy dates</li> <li>• Builder information</li> <li>• Act 250</li> <li>• Private/public water and sewage</li> <li>• Use of whole house ventilation system</li> </ul>
General Building Description	<ul style="list-style-type: none"> <li>• Home type</li> <li>• Volume and floor area</li> <li>• Number of floors and bedrooms</li> <li>• Basement type</li> <li>• Orientation and footprint</li> </ul>
Energy Code Compliance Information	<ul style="list-style-type: none"> <li>• Familiarity with RBES code</li> <li>• RBES certificate displayed</li> </ul>
VTcheck Compliance Information	<ul style="list-style-type: none"> <li>• Areas/perimeters for multiple sections of ceilings,</li> </ul>

Data Category	Types of Data Collected
	<p>walls, basements, and floor and multiple doors, windows, and skylights</p> <ul style="list-style-type: none"> <li>• Insulation R-values for all components and sections</li> <li>• Heating and cooling equipment type and efficiencies</li> <li>• Calculated and required UA</li> </ul>
Detailed Building Characteristics	<ul style="list-style-type: none"> <li>• Details on each building envelope component</li> <li>• Areas/perimeters, orientation, location</li> <li>• Insulation R-values</li> <li>• Framing spacing</li> <li>• Window and skylight areas, orientation, frame type, glazing type, U-value</li> <li>• Door characteristics</li> <li>• Heating/cooling system type, heating fuel, capacity, efficiency, make, controls, zones, thermostat type, venting</li> <li>• Fans and ventilation</li> </ul>
Water Heater Characteristics	<ul style="list-style-type: none"> <li>• Fuel type, efficiency, size</li> </ul>
Air Infiltration/Ventilation Characteristics	<ul style="list-style-type: none"> <li>• Blower door measured air infiltration rate</li> </ul>
Detailed Appliance and Lighting Characteristics	<ul style="list-style-type: none"> <li>• Refrigerators, room air conditioners, dishwashers, clothes washers</li> <li>• Manufacturer, vintage</li> <li>• Fuel type for clothes dryers and cooking stoves</li> <li>• Number of ceiling fans</li> <li>• Lighting fixture type and location, lamp type, control type</li> </ul>